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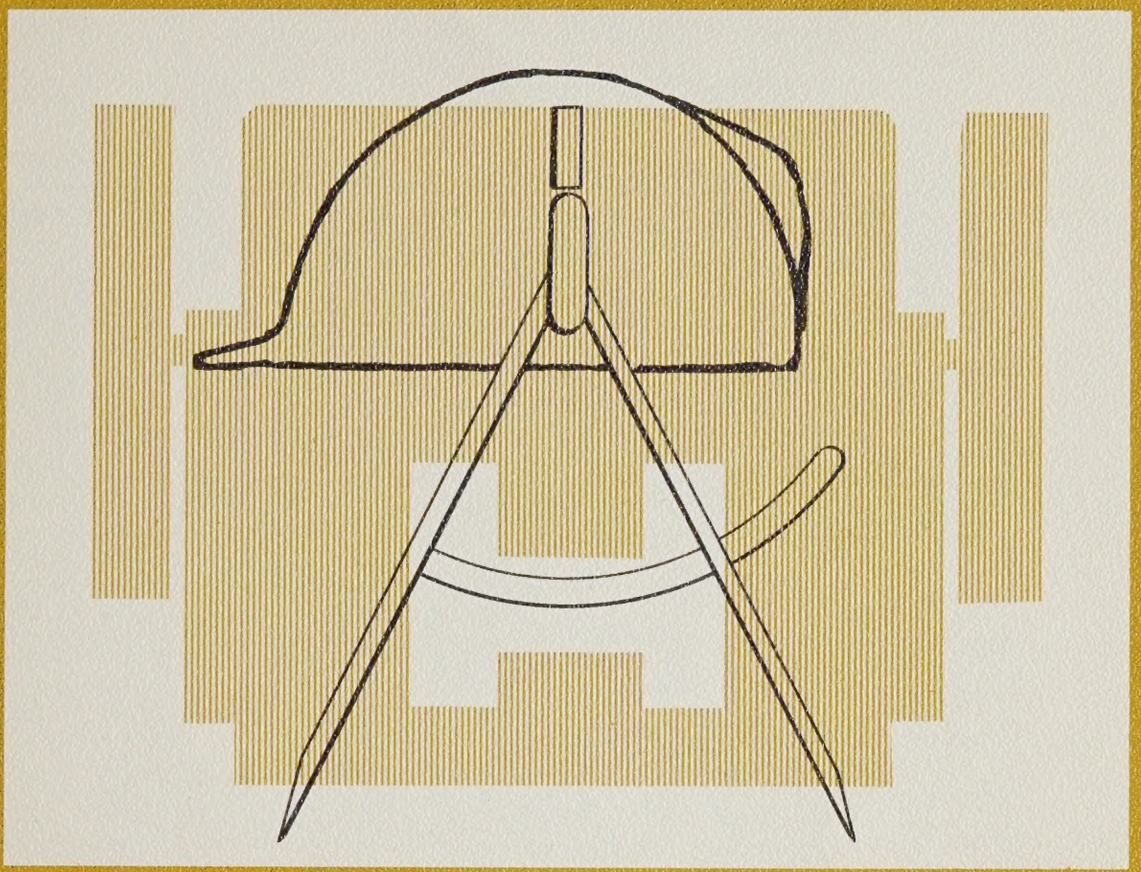

SCIENCE, TECHNOLOGY, TRADES

grades 10, 11 and 12 – volume 1

EDUCATIONAL TELEVISION SERIES 1967-68

Educational Television Branch
ONTARIO DEPARTMENT OF EDUCATION
1670 Bayview Avenue / Toronto 17

program schedule

SCIENCE, TECHNOLOGY AND TRADES
grades 10, 11 & 12

24 programs of 20 minutes each

PROGRAM NO.	CBC 9:40	CBC Repeat 9:30	CBOT 9:40	CHCH 9:40	CJOH CJSS 9:40
1	Oct. 16	Oct. 20	Oct. 17	Oct. 26	Oct. 19
2	Oct. 23	Oct. 27	Oct. 24	Nov. 2	Oct. 26
3	Oct. 30	Nov. 3	Oct. 31	Nov. 9	Nov. 2
4	Nov. 6	Not Shown	Nov. 7	Nov. 16	Nov. 9
5	Nov. 13	Nov. 17	Nov. 14	Nov. 23	Nov. 16
6	Nov. 20	Nov. 24	Nov. 21	Nov. 30	Nov. 23
7	Nov. 27	Dec. 1	Nov. 28	Dec. 7	Nov. 30
8	Dec. 4	Dec. 8	Dec. 5	Dec. 14	Dec. 7
9	Dec. 11	Dec. 15	Dec. 12	Dec. 21	Dec. 14
10	Dec. 18	Not Shown	Dec. 19	Jan .11	Dec. 21
11	Jan. 8	Jan. 12	Jan. 9	Jan. 18	Jan. 11
12	Jan. 15	Jan. 19	Jan. 16	Jan. 25	Jan. 18
13	Jan. 22	Jan. 26	Jan. 23	Feb. 1	Jan. 25
14	Jan. 29	Feb. 2	Jan. 30	Feb. 8	Feb. 1
15	Feb. 5	Feb. 9	Feb. 6	Feb. 15	Feb. 8
16	Feb. 12	Not Shown	Feb. 13	Feb. 22	Feb. 15
17	Feb. 19	Feb. 23	Feb. 20	Feb. 29	Feb. 22
18	Feb. 26	Mar. 1	Feb. 27	Mar. 7	Feb. 29
19	Mar. 4	Mar. 8	Mar. 5	Mar. 14	Mar. 7
20	Mar. 11	Mar. 15	Mar. 12	Mar. 28	Mar. 14
21	Mar. 25	Mar. 29	Mar. 26	Apr. 4	Mar. 28
22	Apr. 1	Apr. 5	Apr. 2	Apr. 11	Apr. 4
23	Apr. 8	Apr. 19	Apr. 9	Apr. 18	Apr. 11
24	Apr. 22	Apr. 26	Apr. 16	Apr. 25	Apr. 18

IMPORTANT *PLEASE NOTE!*

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SCIENCE, TECHNOLOGY, TRADES, Volume 2 2 5 8

SCIENCE, TECHNOLOGY, TRADES—Volume 1

A series of 10 programs of 20 minutes each on Mechanical Technology and Construction Technology for students in grades 10, 11 and 12

This is Volume 1 of a two-volume series

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general introduction to the series

The first ten programs of the 1967-68 Science, Technology and Trades television series are divided into two sections, each five programs in length. The first section of five programs on *Mechanical Technology*, are of specific interest to students in mechanical drafting, machine shop, welding and related disciplines. The second series of five programs entitled *Construction Technology*, relates to architectural technology, architectural drafting and carpentry.

Each program is in the form of a documentary. The content of these programs was prepared on the advice of classroom technical teachers. Workers in actual situations were used, augmented by graphics and some animation.

After Christmas, a series of five programs on *Automotive Technology*, a group of four programs on *Electrical and Electronic Technology*, two programs devoted to the *Introduction of Industrial Physics*, and two devoted to *Industrial Chemistry* will be shown for the balance of the season. The teachers guide for the remaining fourteen programs in the series will be Volume two, available in December. The last program of the year will be an explanation of the proposed restructuring of technical courses needed to meet the requirements of industry today.

It must be emphasized that the Science, Technology and Trades programs are intended as a basis for further detailed study conducted by the classroom teacher. They are an adjunct to the course of study and with the participation of the teacher and student, can be a stimulating experience.

introduction to Mechanical Technology

This group of five programs introduces some of the principles involved in the design and fabrication of a manufactured product. The product chosen is a Canadian non-consumer product—a tool—a chain-saw. It should be emphasized that this product is a typical example. Since all manufactured products are an attempt to satisfy a need, each evokes specific problems to be solved in design, production and marketing. Although the selection of a single product for study did impose limitation upon the scope of the investigation, the narrow concept allowed some study in depth. The chain-saw is complex enough to involve several industrial processes, and yet simple enough to be understood by the students. The programs should not be regarded as lessons on particular topics, but as an overview of the subject area. They are intended to stimulate interest, to create a desire on the part of the students for more information. Actual applications of production methods are shown which provide a basis for further study as the teacher desires. Although for the most part the level of sophistication is appropriate for grade 11 students, those in grades 10 and 12 will benefit from viewing these telecasts as well.

program one

DESIGN OF A PRODUCT

The purpose of this program is to introduce the premise that a definite market demand instigates the design of a product. The requirements of the potential user, modified if necessary by the cost of production, plant capabilities, safety regulations, and materials available, establish the configuration and external appearance of the manufactured product.

PROGRAM CONTENT

The opening sequence of this program establishes the need for the chain-saw as a practical means of increasing the efficiency of the forestry industry. The requirements of the operator for a light-weight, powerful, compact, rugged, and easily-serviced tool present the design team with their main problems. Although the design team is made up of many specialists within the company, outside consultants are frequently employed to do field research and time-motion studies. The many practical considerations growing out of the demands of the operator increase the complexity of the design problem. The gasoline tank must have a sufficient capacity to ensure a reasonable operating time without refuelling. The saw must be capable of operating under a wide range of temperatures. Forestry Department safety regulations require spark-arrestors, provision for filling the gas tank from regulation gasoline safety can, venting of the gasoline tank to prevent pressure build-up in hot weather, and a safety throttle lock. All these practical considerations and problems are compounded by the demands of the marketing department for a product which is cheap to make and yet has a good appearance. When all the problems of design have been studied through the use of sketches and prototype models, and solutions have been found, working drawings of the saw are made. The production cycle can now begin.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Examine a familiar object (a screwdriver, for example) to establish why it has a particular size, shape, colour; why particular materials are used. Emphasize that in general, most manufactured objects are designed to meet a particular need, and that the user influences the design. The screwdriver's size, shape and materials must enable it to be used efficiently by the man driving the screws. Its colour might be the result of a desire on the part of the user for easy identification, as in the case of Robertson screwdrivers, or it might be solely for appearance.
2. Have each pupil select a simple object and explain or list the considerations which might have caused the designer to select the shape, size, colour, finish and materials for its manufacture. These lists should be examined and amended after each of the programs is viewed.

SUGGESTED POST-VIEWING ACTIVITIES

1. Re-examine the object (the screwdriver), and through discussion enlarge upon those design considerations discussed prior to viewing the program. Discuss the use of models and prototypes. Question the value of field research studies.

Question the reason sandcasting was used to produce the prototype engine parts rather than die-casting.

2. If possible, borrow a chain-saw and have the students handle it. Let them decide whether it meets the requirements outlined in the program.
3. Emphasize through discussion that while the chain-saw is the object of the program's investigation, the principles involved can be applied in varying degrees to any manufactured product.

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program two

MATERIALS

The purpose of this program is to examine some of the materials used in the manufacture of a product, with the chain-saw serving as the example to explain why certain materials are used for particular parts.

PROGRAM CONTENT

The engineer chooses aluminum for the engine cylinder and piston because of its lightness and good heat transference properties. He selects steel forgings for the crankshaft and connecting rod where wear resistance and strength are important. Magnesium is used for all housings because of its relative strength and light weight. Because magnesium is highly reactive, all steel fastening used must be cadmium or zinc-plated to reduce the galvanic potential and thus electrolytic corrosion.

Heavy wear and its unusual shape dictate the use of a steel investment casting for the sprocket. The chain bar is made of steel which is surface hardened to improve its wear characteristics. The chain cutter links are made from nickel steel to provide good impact strength at low temperatures.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Review program one to examine the requirements of the chain-saw operator. Question how resistance to wear, heat and corrosion might be accomplished through the choice of materials.
2. Consider any object to ascertain why various parts are of different materials.
3. Question the class as to their possible choice of materials for the chain-saw and why. Possibly list materials on chalkboard.

SUGGESTED POST-VIEWING ACTIVITIES

1. Compare the materials selected by the engineers for the chain-saw with those selected by the class.
2. Discuss possible alternative materials for various parts, e.g. plastics or moulded fibreglass to replace magnesium housings. High impact plastics have been used in housings for hand-power drills, sabre saws, routers, etc.

3. Enlarge upon processes introduced in connection with materials used. Examples:
   a. steel investment castings
   b. heat treatment
   c. resistance heating
   d. forging
4. Explain fully the terms galvanic scale, galvanic cell, electrolytic corrosion.
5. Expand on chrome, zinc and cadmium plating.
6. Have each student explain why particular materials might be used for the various components of the simple object they selected for study prior to program one.

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program three

PRODUCTION PROCESSESS

The purpose of this program is to introduce several basic production processes which, although applied to the production of the chain-saw in this program, are fundamental production methods, widely used to produce fabricated products.

PROGRAM CONTENT

The major lightweight aluminum and magnesium components of the chain-saw are die-cast. Molten magnesium presents some problems in handling, since it tends to flash and burn when exposed to air. Magnesium chloride flux is floated on the surface of the molten magnesium to prevent this. Magnesium presents some machining problems. Since it is a naturally abrasive material with poor thermal conductivity, it causes excessive tool wear. Injection moulding is used to produce small parts from thermal plastics. The chain bar of the saw is a steel laminate copper brazed together in a controlled atmosphere furnace. An overlay of a hard material is welded to the chain bar nose to reduce wear. Chain cutters are stamped out on presses as chain links. The rivets for the chain are produced on automatic screw machines. Chains are hand-assembled. The engine cylinder bore is chrome-plated to provide a hard-wearing surface. Final assembly and painting operations are carried out after the engines are bench tested.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Consider the production methods that might be used to produce the simple object the pupils selected for study prior to program one.
2. Consider the production methods which might be used to produce any common manufactured object.
3. Consider the production methods which might be used to produce the components of the chain-saw. List these on the chalkboard.

SUGGESTED POST-VIEWING ACTIVITIES

1. Compare the actual methods used to produce the chain-saw with those suggested by the students prior to the program.
2. Discuss alternative methods that might have been used to produce chain-saw components. Emphasis should be placed on ease of handling, minimum scrap, and the effect on choice of process of the number of parts required.
3. Discuss in depth the die-casting process.
4. Possibly compare the copper brazing process with silver soldering in a controlled atmosphere furnace. (Note the extreme temperature of 2050°F for copper brazing)
5. Discuss the automatic screw machine.
6. Question or discuss the necessity of using a high nickel content steel for chain-cutters.
7. Discuss in depth the injection-moulding of thermal plastics.

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program four

QUALITY CONTROL

The purpose of this program is to explain the concept of quality control, which aims at establishing and maintaining product quality and preventing defects in the manufacturing cycle, as opposed to the concept of inspection of the finished product. Inspection is not quality control. Procedures used by inspection on the plant floor may be instituted on the recommendations of the quality control department, but the quality control department is independent of production.

PROGRAM CONTENT

In the plant, checks aimed at quality control begin with raw material. Steel and other materials must be checked to ensure that they meet the designer's specifications. Components purchased outside must be accompanied by a certificate from the manufacturer guaranteeing quality equal to or above ordering specifications. Inspections are carried out on a sampling basis worked out by the quality control department. During production, floor inspectors check the operators' work to ensure that production standards are being met. A number of destructive tests are carried out on components at various stages of production by the quality control department. The metallurgist controls plating solutions and advises the heat treatment department on any necessary modifications to the heat treatment cycle. Quality control carries out exhaustive field tests on the product. Following field tests, the tested saws are stripped down to measure wear on components under field conditions. From these tests the quality control department is able to recommend design changes to improve the product.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Introduce the concept of quality control of raw materials by examining a simple object, perhaps the screw-driver, and asking the class how they might be certain the steel for the blade was the correct alloy. Consider a guarantee from the supplier as opposed to actual testing.

2. Introduce the concept of inspection, using measuring tools and comparison gauges. The quality standards are established by the quality control department.
3. Identify some of the gauging methods used on the production of the chain-saw.
4. Explain the difference between destructive and non-destructive tests.

SUGGESTED POST-VIEWING ACTIVITIES

1. Discuss the importance of quality control operations as applied to design, materials and production processes. Perhaps assign a research report on the topic.
2. Assign an essay on the quality control operations carried out by a local manufacturer.
3. Discuss the relative merits of gauges and measuring tools for the efficient inspection of finished parts.
4. Discuss the relative merits of a sampling quality audit and a percentage check of parts.

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program five

MACHINES FOR TODAY AND TOMORROW

The purpose of this program is to introduce a number of new manufacturing processes in use on a limited basis today, but which may become the fundamental processes of the future. Numerical control of machine tools is also introduced.

PROGRAM CONTENT

The program opens with a sequence devoted to the examination of the powder metallurgy process. The parts are shown being compacted of powdered metals in closed dies to form briquettes. The sintering process is shown, wherein the compacted powders are fused into solid metal in high temperature controlled atmosphere furnaces.

The introduction to powder metallurgy shows the necessity of quality cavity dies. Conventional machining processes are still used to produce some dies, but this program introduces some of the newer non-traditional machining processes.

Electric discharge machining, sometimes called "electrospark machining" or "spark erosion", is shown in some detail.

Other non-traditional machining methods such as abrasive jet machining, ultra-sonic machining, and laser-beam machining are given a more cursory treatment.

Numerical control of machine tools is explained in a simple manner. Emphasis is on the paper tape control system.

Closed-circuit television is mentioned as a means of examining operations on large parts or in hazardous locations.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Discuss with the class some of the changes in materials and processes which have been introduced in the production of manufactured parts over the years. Select a product which has changed radically—a milk container, for example: from glass to plastics or cardboard container.
2. Discuss the difficulties which are encountered in the production of high-quality cavity dies by traditional machining processes.
3. Question the class to obtain a list of any new manufacturing processes they may have encountered in their reading.

SUGGESTED POST-VIEWING ACTIVITIES

1. Discuss the powder metallurgy process. Possibly assign a research report on the topic.
2. Expand on any of the following non-traditional machining processes:
   a. Electric Discharge Machining (EDM)
   b. Abrasive Jet Machining (AJM)
   c. Ultra-Sonic Machining (USM)
   d. Electrochemical Machining (ECM)
   e. Laser Beam Machining (LBM)

Note: An excellent reference manual, "Non-Traditional Machining Processes", has just been published by the American Society of Tool and Manufacturing Engineers, Dearborn, Michigan.

introduction to Construction Technology

This group of five programs serves as an overview of the largest and most complex industry in Canada—the construction industry. The emphasis throughout the series is on heavy construction, as opposed to single dwelling or house construction. The programs show successively the need for the industry, the stratification and multiplicity of employment opportunities among the work force, and finally, the components of a large project and the methods used to build it. Once again, the level of sophistication is grade 11, but the programs should be of interest to all students in the Science, Technology and Trades course.

program six

THE NEED

Using a chronological historical approach, this program demonstrates that Man's needs —physical, social, spiritual, and recreational—caused him to build structures to satisfy those needs. Man's desire to create functional, beautiful structures stimulated the development of building materials and construction techniques.

PROGRAM CONTENT

Man's need for shelter from the elements is shown by a series of still cartoons. Materials, and their availability, frequently imposed limitations on the size and shape of his building.

Because Man is a social being, multiple dwellings and then cities were built.

A brief examination of the Pyramids, the Parthenon, and the cathedrals of St. Peter's, Notre Dame, Brasillia and Liverpool points out Man's desire to pay homage to his gods has influenced the development of architecture and construction technology.

The works of Frank Lloyd Wright, Mies Van der Rohe, Oscar Neimeyer, Le Corbusier and others are used to show the diversity of architectural concepts and building techniques which have evolved since the turn of the century.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Introduce the concept that *necessity* instigated Man's building shelters. Try to develop this concept to prove that the construction industry grew to meet the demand for shelter.
2. Attempt to develop a discussion of religious buildings and monuments as examples of Man's desire to create a beautiful environment in which to glorify his gods.
3. List the following on the chalkboard:

Frank Lloyd Wright	Sir Christopher Wren
Mies Van der Rohe	Edward Stone
Oscar Neimeyer	Le Corbusier
Michaelangelo	Eric Mendelsohn

   Suggest to the pupils that they be prepared to name some of their works and some unique features of these.

SUGGESTED POST-VIEWING ACTIVITIES

1. Have the class list the physical, social, spiritual and recreational *needs* of Man and their satisfaction through buildings.
2. Discuss some of the famous buildings of the past to show the limitations imposed on the builder by the materials and technologies available to him:
   a. The Parthenon was built of stone, which has limited tensile strength, and therefore the beams required many columns to support them at short intervals;

b. The flying buttresses of Notre Dame Cathedral; explain how they transfer roof load to the foundation, thus making possible the delicate lace-like non-bearing walls;

c. Discuss the improvement in design of Wren's dome for St. Paul's as compared with Michaelangelo's St. Peter's.

3. Discuss, in detail if desired, the works of the architects listed on the chalkboard prior to the program.

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program seven

THE PLANNERS

To explain the role of the planners—architect, consulting engineers, designers, and draftsmen—in the construction industry.

PROGRAM CONTENT

Through an interview of Mr. Raymond Moriyama and an examination of his office, the concept of the architect as an artist, engineer and philosopher concerned with "total environment" and "human engineering" is shown. The duties and responsibilities of consulting engineers are explained in some detail by means of film clips of these men at work in their offices and on a construction site. Actual structural, soil, mechanical and electrical engineers have co-operated to make this program accurate in its presentation. Emphasis is placed upon the work of draftsmen, technicians and technologists in the construction industry.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Question the class to find out who actually plans a building. Possibly list on the chalkboard the architect and the various consulting engineers.

2. Discuss the educational background necessary for the various planning jobs. Possibly discuss the backgrounds of draftsmen.

3. Emphasize the necessity for close co-operation between the planners and the client. Point out the necessity for *research* into the client's needs.

SUGGESTED POST-VIEWING ACTIVITIES

1. Discuss the roles of the architects and his consultants in light of the information given in the program.

2. Possibly list several components of building to establish which consultant is responsible for their design and installation, e.g. boilers, foundation, air-conditioning, control of air-conditioning, air compressors, etc.

   Attempt to show the complexity of a building and the diversity of responsibility. Of course, in most cases the architect is ultimately responsible to the client.

3. Assign a research project to compare Mr. Moriyama's concept of architecture with that of other architects such as Frank Lloyd Wright, Neimeyer, or Mies van der Rohe.
4. Discuss the organization of a drawing office.

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program eight

THE CONTRACTOR BUILDS

The purpose of the program is to explain the work and responsibility of the general contractor in the construction industry.

PROGRAM CONTENT

The program opens with an explanation of the procedure of *calling for tenders*. It outlines briefly the steps and personnel involved in the preparation of a *tender*. The relationship of the *sub-contractors* to the general contractor is explained. Once the contract is awarded, the contractor's *building team* is organized, and a detailed work schedule is drawn up. The balance of this program is devoted to an explanation of how the site is prepared, the excavation staked and dug, the footings poured, the foundation wall forms erected, and how the foundation walls are reinforced and poured. A cursory examination is made of the types of pilings and caissons commonly used in foundations.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Have a few newspapers available listing calls for tender. These could be examined and discussed by the class. Emphasize bonding required and closing dates. Point out that calls for tender are not always posted in newspapers.
2. Discuss building contractors. Question the class to discover what are their opinions about the contractor's duties and responsibilities on a large job. Why are sub-contractors used?

   Possibly list the area of responsibility of the general contractor on the chalkboard.
3. Suggest that the students should watch for indications that good safety devices and clothing are used on the building sites shown. (Hard hats are worn by all workmen and supervisors on the sites.)

SUGGESTED POST-VIEWING ACTIVITIES

1. Discuss a building contract. Who are the contracting parties? Drawings and specifications become legal addenda to the contract. What are penalty clauses, bonus clauses, and contingency funds? Possibly discuss insurance and bonding procedures.
2. Discuss the personnel of a contractor's *building team*. Emphasize the roles of the superintendent, the engineer, the carpentry foreman and the labor foreman. Point out that *most* superintendents begin as carpenters. Since the carpenter works with all other trades, he has a good knowledge of the work procedures employed in all phases of construction.

program nine

THE STRUCTURE

This program explains the function of each of the basic components of a building structure.

PROGRAM CONTENT

Emphasis is placed upon methods of reinforced concrete construction without particular reference to structural steel. This approach enables a detailed examination of the work of the carpenter in building formwork. Each basic building component is examined. Reinforced concrete columns, both pre-cast and poured on the site, are shown as the principal vertical supporting members of the structure. Beams of various types are shown. The placement of reinforcing is explained. The theory of pre-stressing in beams and slabs is explained briefly. Various types of slabs are shown. The formwork necessary to support the suspended type of slab is explained in detail. Lift-slab construction is not shown or discussed.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Discuss the three principal materials used for the structure or skeleton of a building: wood, structural steel, and reinforced concrete.
2. Explain the chemical composition of concrete and the advantages gained by its use, e.g. fireproof; can be cast to any shape; easily handled.

   Discuss compressive, tensile and shear strength of the concrete. Question the class as to why steel reinforcing is needed.
3. Have the class try to list the basic members of a building's structure. Perhaps list these on the chalkboard: columns, beams, and slabs.

   If possible, list the types of each basic component.

SUGGESTED POST-VIEWING ACTIVITIES

1. Discuss in detail the placement of reinforcing rod in concrete members.
2. Discuss pre-tensioning and post-tensioning of cables in pre-stressing concrete members. In reviewing the concept of pre-stressing, the principle can be easily demonstrated with a flexible stick, a piece of string and a weight.

   a. Support the stick at each end and place the weight in the centre. The wood sags.

   b. Fix the piece of string to one end of the stick, pull on the string until the stick bows slightly, and fix the free end of the string to the other end of the stick. Pluck the string to demonstrate that it is under tension. This causes compression of the stick.

   c. Place the weight on the stick once more. Note that the stick tends to straighten, but does not sag.

      The compressive stress induced by the string must be overcome before the weight can cause the stick to sag.

program ten

READY FOR PEOPLE

The purpose of the program is to show the various finishing operations required to complete a building and the variety of specialist craftsmen involved.

PROGRAM CONTENT

The opening sequence presents the finished structure as the framework from which the electricians, plumbers, pipefitters and sheet metal workers hang the pipe, conduit and ducting which provide the essential services to all parts of the building. This is followed by a brief description of the preliminary and finishing work done by these trades plus the masons, bricklayers, lathers, glaziers, plasterers, painters, tile-layers and carpet-layers. The diversity of work done by the carpenter is emphasized. Where possible, modern techniques and materials are shown, but the traditional work of each trade is emphasized. Good safety practice is evident throughout the program.

SUGGESTED PRE-VIEWING ACTIVITIES

1. Try to list on the chalkboard all the trades involved in a large building project.
2. Set up a simple schedule to be filled in after the program is seen.
3. Discuss the need for inspection. Try to list the various types of inspector.

SUGGESTED POST-VIEWING ACTIVITIES

1. Review list to add any trades not listed initially. Discuss the nature of the work of some of the trades to discover what type of training or education would be required for each.
2. Discuss the trend toward the use of prefabricated units requiring installation only. Emphasize that much of the installation of building units is done by carpenters.
3. List on the chalkboard the many jobs done by the carpenter.
4. Assign a major research project on safety practice within the construction industry. This should include regulations imposed by law, insurance companies, and contractors.
5. Initiate a formal debate requiring organized preparation of the following (or on similar topics):
   a. The relative importance of any two trades (this should be controversial)
   b. The merits of structural steel construction versus reinforced concrete
   c. Theoretical knowledge versus practical experience as a requirement for supervisory work

FOR OPTIMUM VIEWING CONDITIONS

1. Review Teacher's Guide well in advance of each telecast.

2. Have the set on and adjusted, sound off, prior to telecast.

3. Assure student comfort
   - — located for best viewing
   - — no glare, reflection on screen
   - — room properly ventilated
   - — suggested materials ready
   - — within maximum of 20′ of the screen

4. Seat yourself where you can observe both the telecast and your students' reactions.

This diagram shows the suggested placement of the television set: